



AIR DOMAIN INVESTOR BRIEFING

10/11 July 2014

Air Domain Investor Briefing – 10/11 July 2014

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Ian King

Peter Lynas

BAE SYSTEMS - AIR DOMAIN

BROADLY BASED CAPABILITIES

- Pre-eminent combat aircraft position
 - Typhoon export prime contractor
 - Key F-35 partner
- Deep support and upgrade provision
- A leader in advanced airborne electronic systems
- Growing commercial aero electronics activity
- Multi-platform guided weapons supply (MBDA)
- Strong technology footprint

A Sustainable Portfolio



Agenda

Day 1

- **Sales overview** - Peter Lynas
- **Typhoon** - Nigel Whitehead

- **Lunch**

- **US overview** - Jerry DeMuro
- **F-35** - Nigel Whitehead
- Tom Arseneault

- **F-35 manufacture** - Site tour

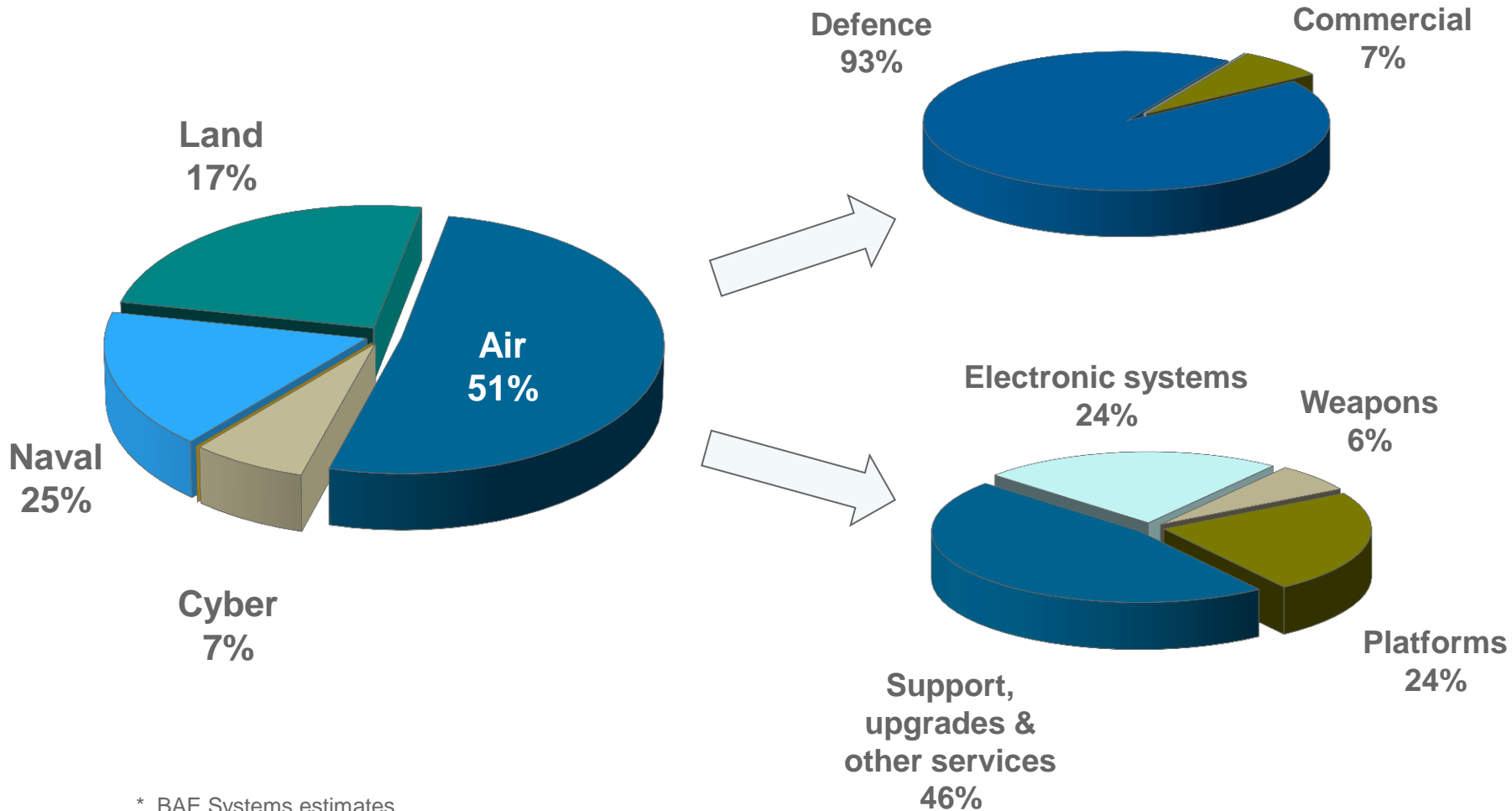
- **International Programmes** - Guy Griffiths
- **UAS programmes** - Nigel Whitehead

Day 2

- **Typhoon assembly** - BAE Systems, Warton
- **Typhoon operations** - RAF Coningsby

Sales by domain – 2014*

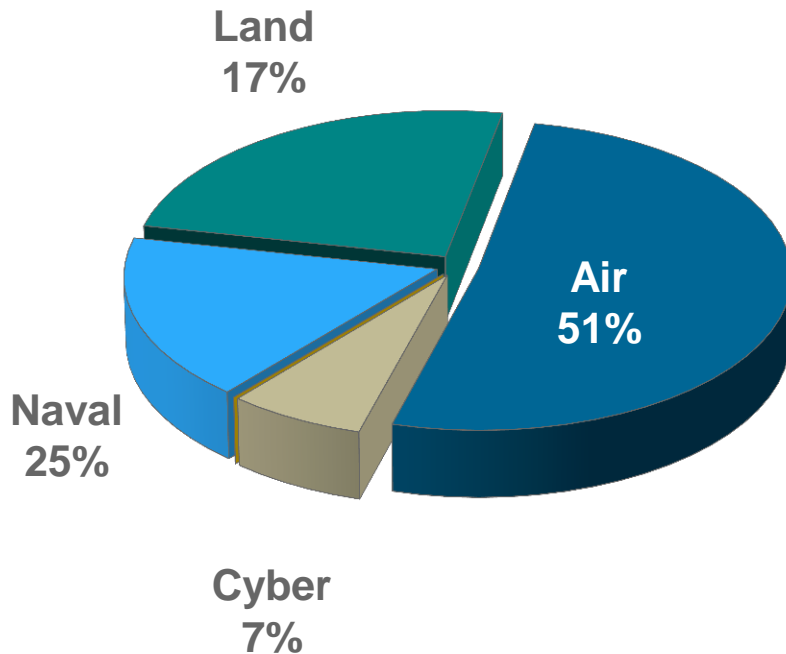
– Broad spread across domains



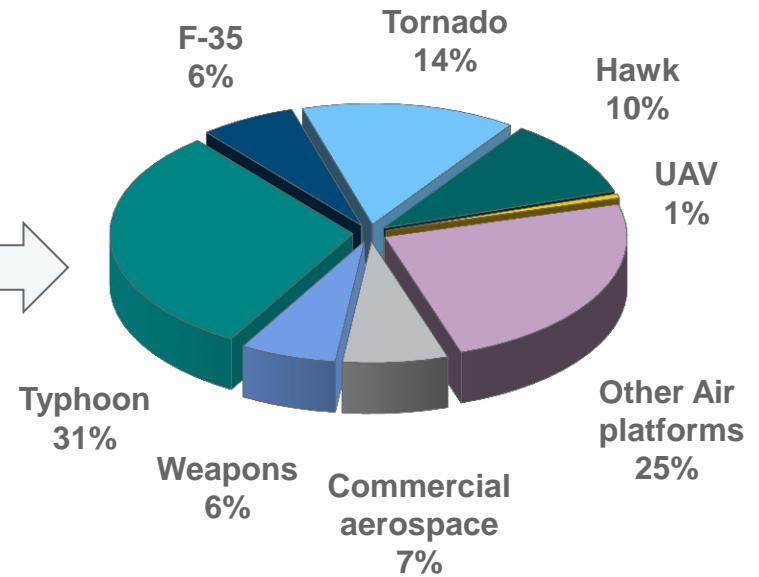
* BAE Systems estimates

Sales by domain – 2014*

– Strong Air platform positions



Sales by aircraft platform



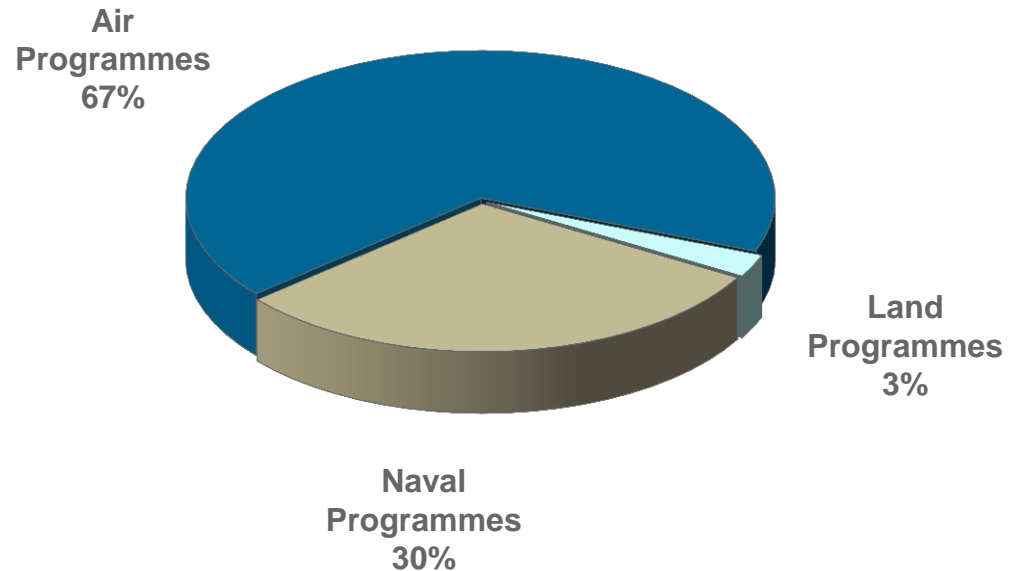
* BAE Systems estimates

Sales by major programme

– *Strong position from key programmes*

*Saudi Support
KSA Typhoon
F-35
European Typhoon
Astute
USN Ship Repair
Successor
Oman
QEC Carrier
Type 26
RN support
UK MASS*

*2015 – 2019 sales**

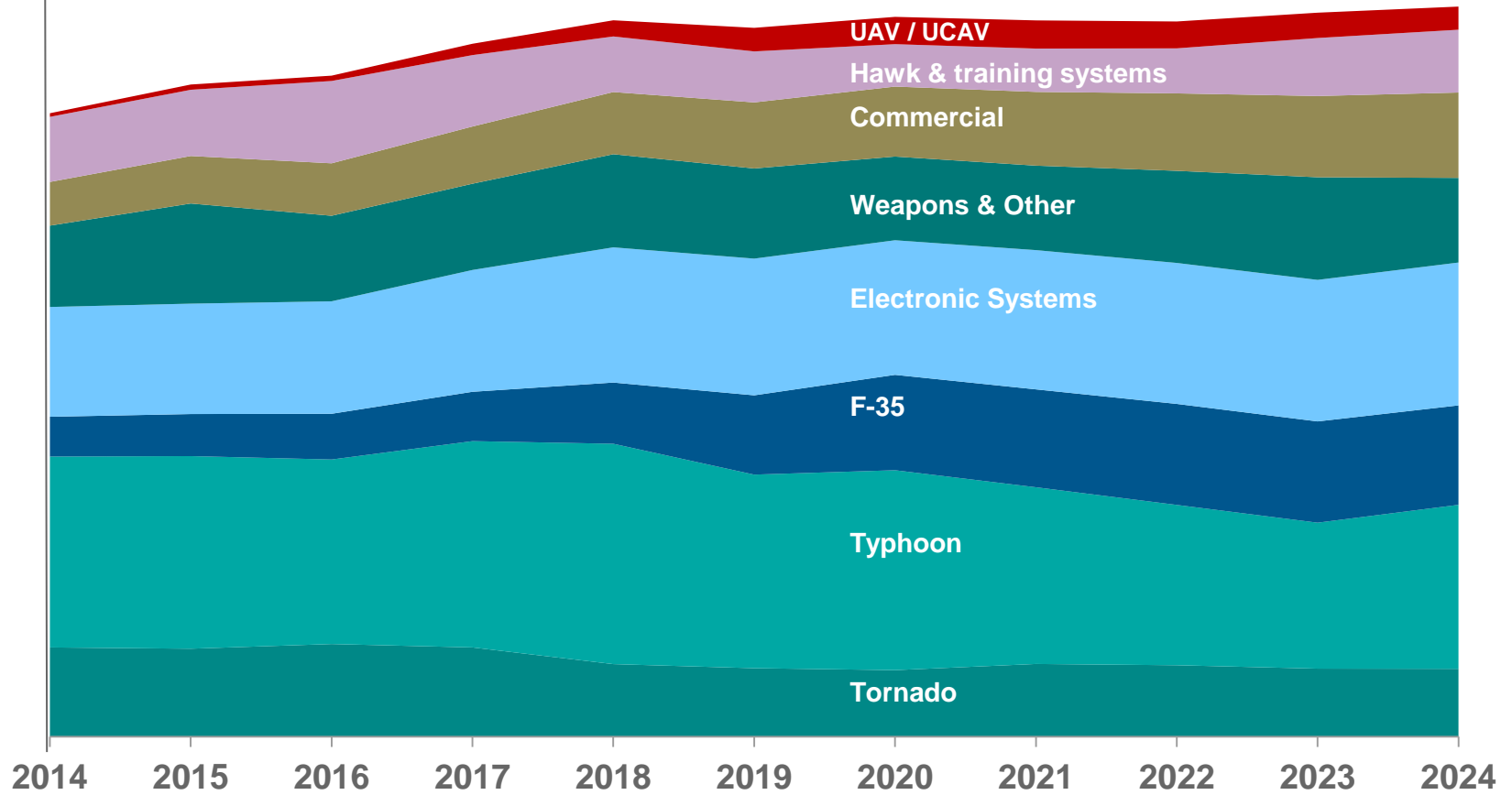


Over the next 5 years 12 programmes are expected to deliver approximately 45% of Group sales

* BAE Systems estimates

Air domain sales*

– Anticipated revenue sustainment



* BAE Systems estimates

Nigel Whitehead

BAE SYSTEMS AIR SECTOR OVERVIEW

July 2014

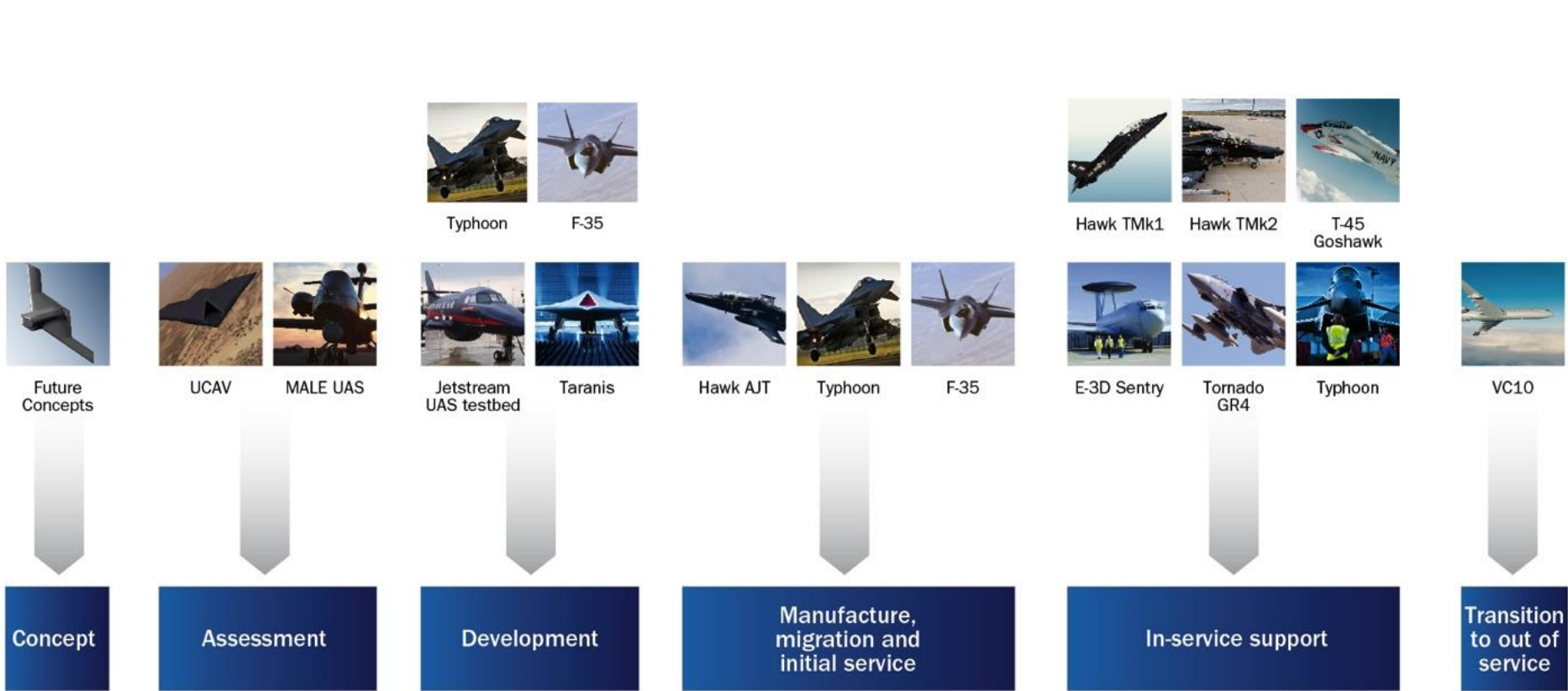




BAE SYSTEMS IN THE AIR DOMAIN

- Lead position in the UK
- Pan-European programme partner
- Key technology partner on F-35
 - Major role across all markets
- Growing international customer base
- Positioning for future programmes

Today's portfolio



TYPHOON A GREAT TRACK RECORD

More than 400 aircraft delivered

In service around the world with six
air forces

Oman soon to be number seven

Operation Ellamy:

- Proved Typhoon's world class credentials
- Illustrated our 'End-to-End' service offering





TYPHOON FIT FOR THE FUTURE

“Future Force 2020” – Typhoon capability enhancements

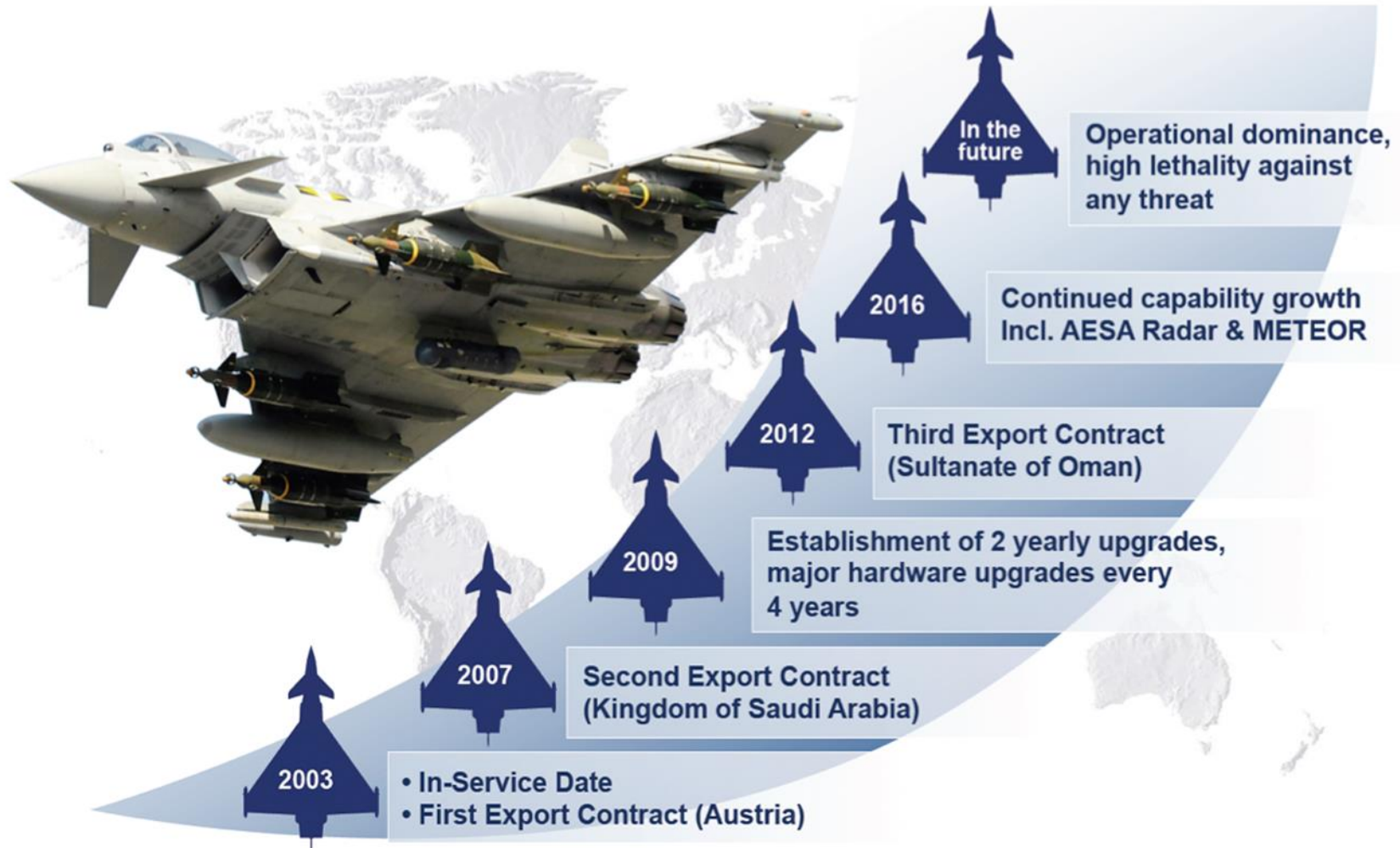
Unrivalled swing-role performance with Meteor, Stormshadow, Paveway IV and Brimstone

Superior in air combat to all other aircraft in its class

- Quicker to climb, accelerate and intercept
- Combat effectiveness typically 3 times better than its rivals



The development journey



Multi-role/swing role - weapon configurations



Air Superiority



- 6 BVRAAM
- 2 SRAAM
- 27mm Mauser
- 3x 1000L Fuel Tanks

Deep Strike



- 4 Laser/GPS Guided Bombs
- 2 Stand-Off Missiles
- 4 BVRAAM
- 2 SRAAM
- 27mm Mauser
- 1x 1000L Fuel Tank

Interdiction



- 4 Laser/GPS Guided Bombs
- 3 BVRAAM
- 2 SRAAM
- 27mm Mauser
- 1 LDP/RECCE
- 3x 1000L Fuel Tanks

Close Air Support

- 4 Air-to-Ground Rocket Launcher
- 2 Laser/GPS Guided Bombs
- 3 BVRAAM
- 2 SRAAM
- 27mm Mauser
- 1 LDP
- 1x 1000L Fuel Tank



SEAD

Suppression and Destruction of Enemy Air Defences

- 2 Laser/GPS Guided Bombs
- 2 ARM
- 3 BVRAAM
- 2 SRAAM
- 27mm Mauser
- 1 LDP
- 3x 1000L Fuel Tanks



Maritime Attack

- 4 Anti-Ship Missiles
- 4 BVRAAM
- 2 SRAAM
- 27mm Mauser
- 3x 1000L Fuel Tanks



Eurofighter 2020 & beyond





TYPHOON SUPPORT

- Working in partnership with our customers to ensure ongoing operational requirements are met
- Maximises availability in a cost-effective way
- Demonstrates commitment to through-life support
- Typhoon Availability Service delivers:
 - Air and ground crew training
 - Maintenance and servicing
 - Technical support
 - Inventory and asset management
 - State of the art facilities at RAF bases
 - Significant savings identified and agreed over life of aircraft



TRAINING SOLUTIONS

- Providing effective, integrated Training Solutions
- Hawk aircraft sold in 18 countries – the world's most successful lead-in fighter trainer
- Potential for future orders
- US TX requirement is a massive opportunity

Jerry DeMuro

Inc. – a commanding breadth of capabilities



ELECTRONICS



MARITIME



LAND



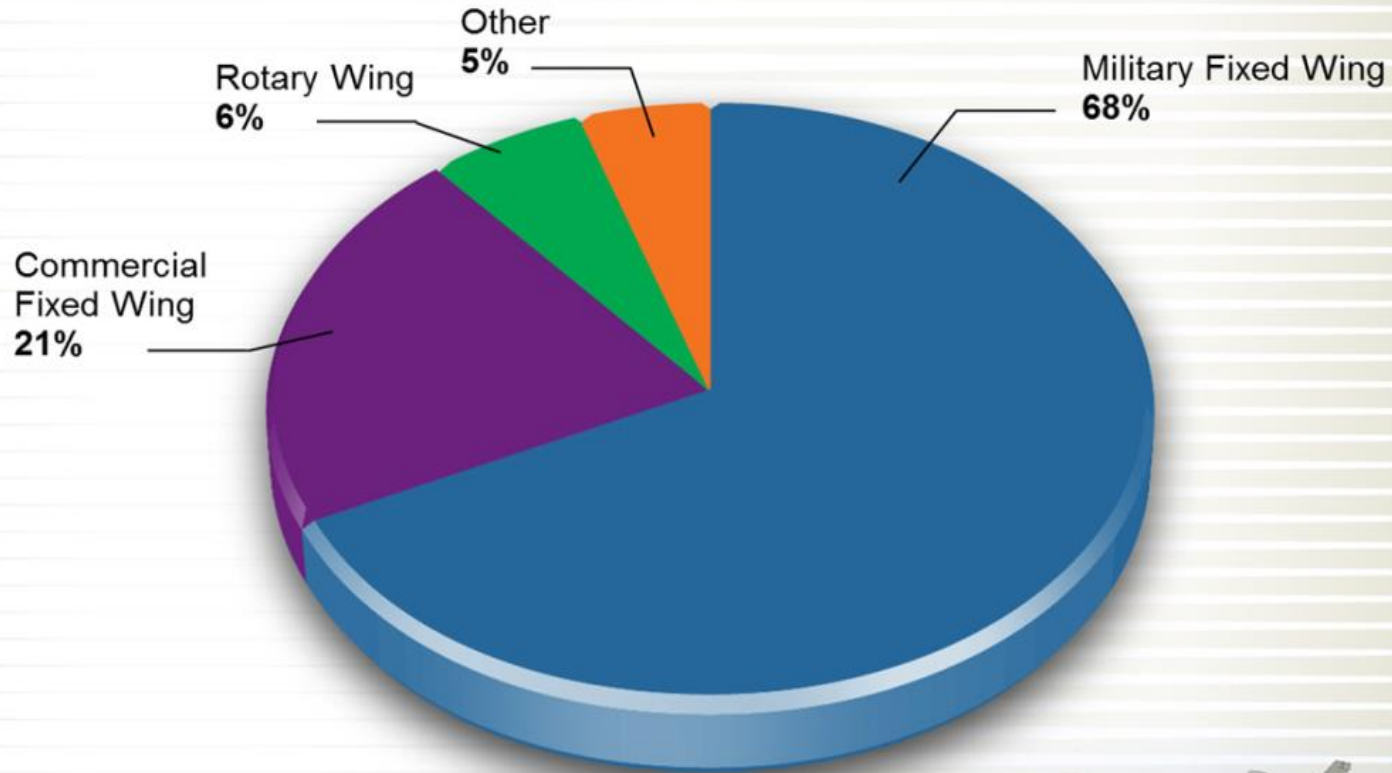
INTELLIGENCE



SUPPORT SERVICES



Inc. air domain sales*



* Estimated Sales 2014-2018



Inc. air overview – extensive platform diversity





BAE SYSTEMS IN THE AIR DOMAIN

- Lead position in the UK
- Pan-European programme partner
- Key technology partner on F-35
 - Major role across all markets
- Growing international customer base
- Positioning for future programmes

Nigel Whitehead



F-35 LIGHTNING II

- Largest defence programme in the world
- Requirement in excess of 3,000 aircraft
- US-led with 8 International Participant Nations – UK, Italy, Netherlands, Australia, Canada, Denmark, Norway & Turkey
- Already selected by Israel, Japan & South Korea
- Lockheed Martin is Prime Contractor, with Partners BAE Systems & Northrop Grumman
- Three F-35 variants
 - A – Conventional Take Off and Landing (CTOL)
 - B – Short Take Off and Vertical Landing (STOVL)
 - C – Carrier Variant (CV)



OUR EXPERTISE AND TECHNOLOGY APPLIED TO F-35

BAE Systems helped Lockheed Martin win versus Boeing in 2001 by bringing military aircraft expertise that is critical to the development, manufacture and support of the F-35 Lightning II

- STOVL expertise
- Advanced manufacturing
- Systems engineering
- Subcontract management
- Structural test
- Availability contracting

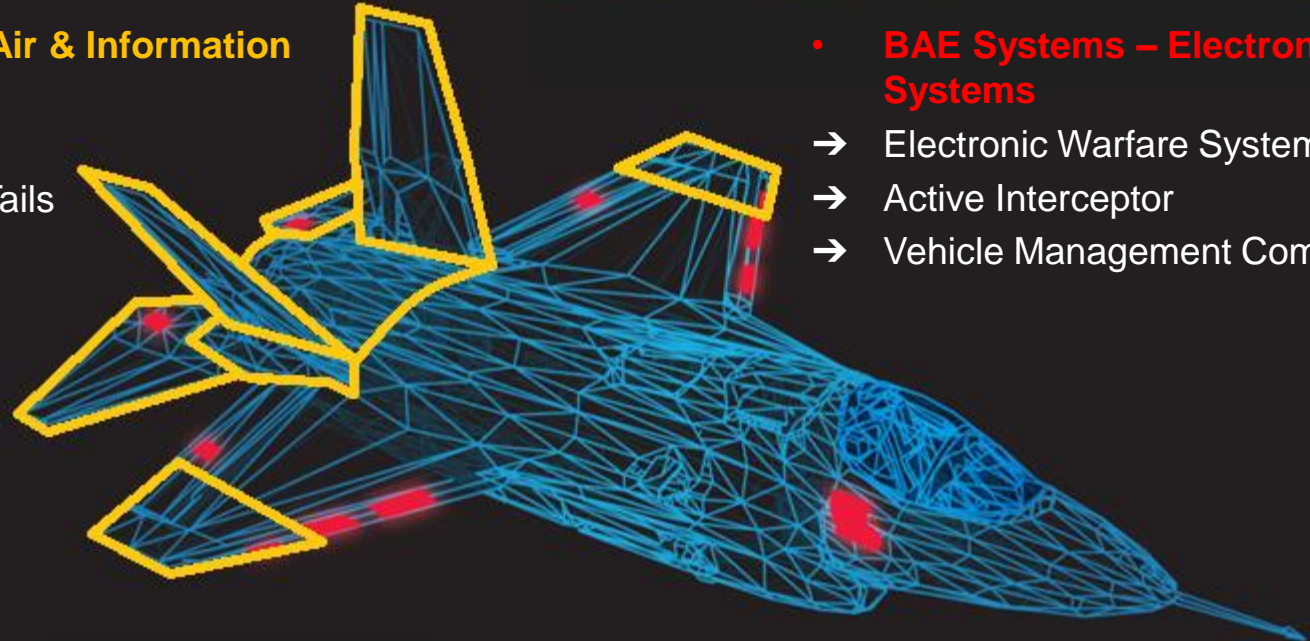
Electronic systems brings globally-recognised avionics expertise



F-35 team – BAE Systems contribution

BAE Systems – Military Air & Information

- Aft Fuselage
- Horizontal & Vertical Tails
- CV Wing Fold
- Fuel System
- Crew Escape System
- Life Support System
- STOVL Flight Test
- Full Airframe Fatigue Testing



• BAE Systems – Electronic Systems

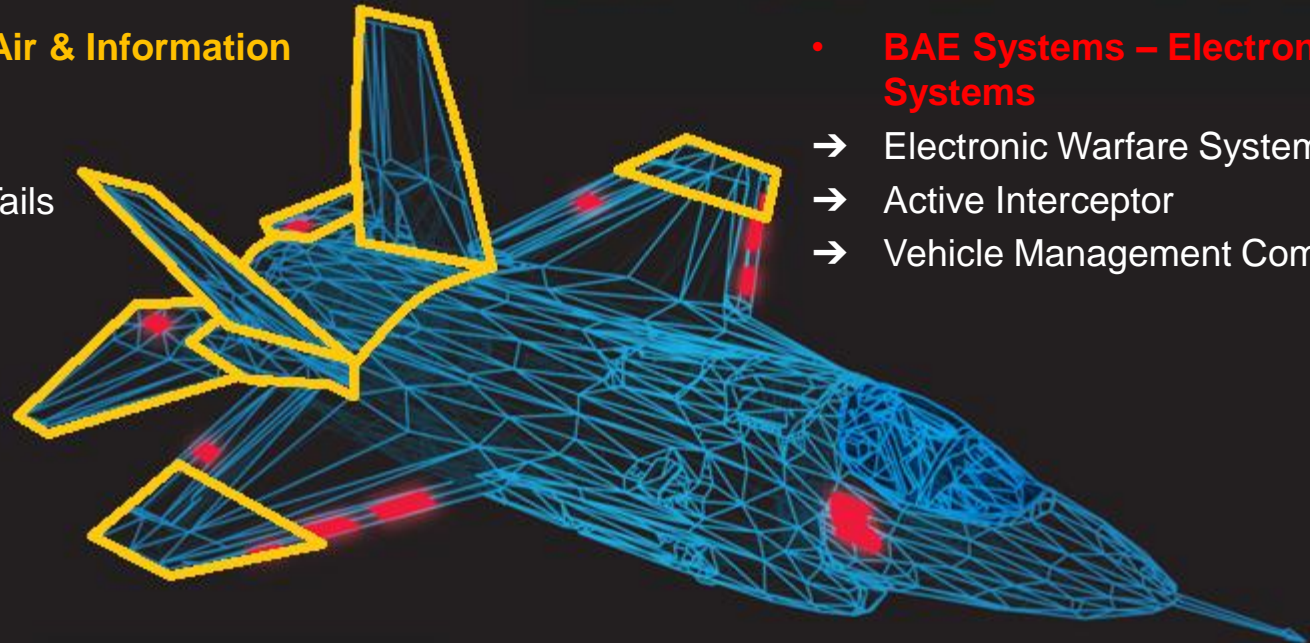
- Electronic Warfare System
- Active Interceptor
- Vehicle Management Computer

Tom Arseneault

F-35 team – BAE Systems contribution

BAE Systems – Military Air & Information

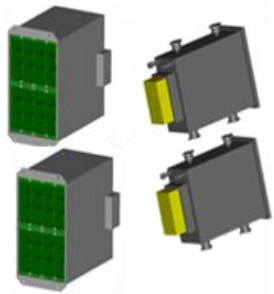
- Aft Fuselage
- Horizontal & Vertical Tails
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- Fuel System
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- STOVL Flight Test
- Full Airframe Fatigue Testing



• BAE Systems – Electronic Systems

- Electronic Warfare System
- Active Interceptor
- Vehicle Management Computer

F-35 - Electronic Warfare System



Countermeasures

- Balanced Robust Design
- Operationally Effective



Embedded EW Arrays/ Electronics

- Broadband Frequency Coverage
- Situational Awareness



- Broad Bandwidth
- Rapid Re-programmability
- Proven Advanced Emitter
- Location Algorithms

Advanced Digital Receiver Architecture

Less Volume, 1/2 Weight, 1/4 Cost, and Four Times the Reliability of Legacy Systems

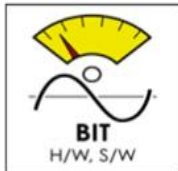
F-35 - Fly-by-Wire flight control system



**Solid State Rate Gyro
Assembly (SSRGA)**



**EXEC
SOFTWARE**



**BIT
H/W, S/W**



**Vehicle Management
Computer**



Active Inceptor



**Active Throttle
Assembly**

Tom Arseneault



**BAE SYSTEMS, INC.
AIRCRAFT
ELECTRONICS
OVERVIEW**



AIRCRAFT ELECTRONICS: A DIVERSE PORTFOLIO

- Products / programmes
- Customer base
- A \$30bn addressable market
- Well positioned across all aspects of aircraft requirements
 - Flight & engine controls (propulsion and steering)
 - Communications & Management Systems
 - Defence & attack components



MILITARY AIRCRAFT ELECTRONICS

- Flight Controls
 - FADEC Systems
 - Fly-by-Wire / Active Inceptor Systems
- Electronic combat
- Survivability & targeting
- Intelligence, surveillance & reconnaissance solutions
- Non-OEM combat aircraft upgrades



Image courtesy of Bell Helicopter





MILITARY FLIGHT/ ENGINE CONTROLS & COMMUNICATIONS



- Flight controls
(Fly-by-wire / active inceptor systems)
- Identification friend or foe (IFF)
- Link 16
- Q-Sight





ELECTRONIC COMBAT

Keeping the electromagnetic spectrum to our advantage

- Electronic Attack
- Electronic Protection
- Electronic Warfare Support



SURVIVABILITY & TARGETING

- ATIRCM
- CIRCM
- APKWS



Intelligence, Surveillance & Reconnaissance Solutions

Actionable intelligence for our warfighters through electronic products and innovative technical solutions from the *depths of the ocean to outer space, and everywhere in between*

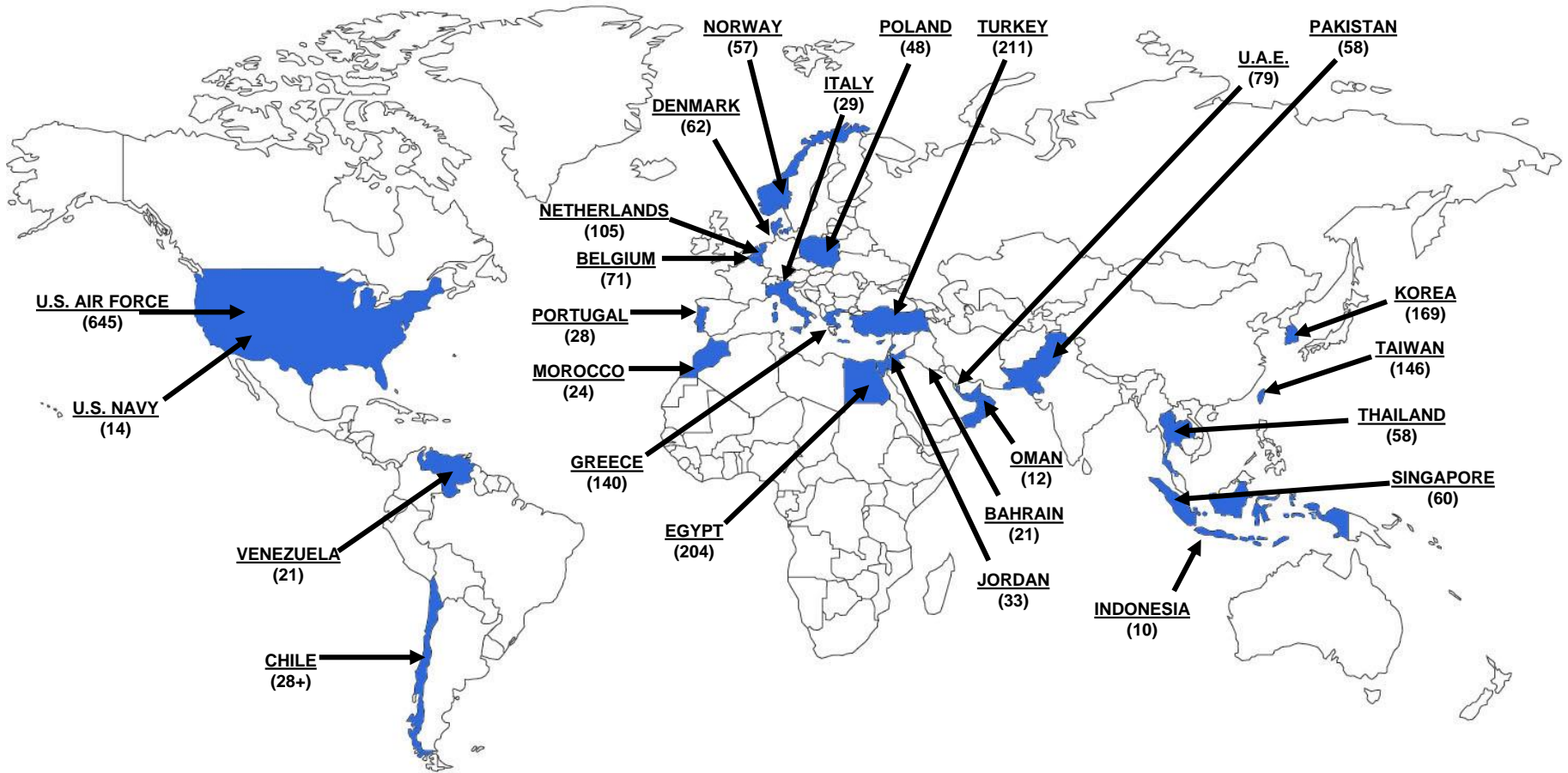
- SIGINT sensors
- EO/IR sensors
- Multi-INT sensors
- Hyperspectral sensors
- Mission Workstations
- Acoustics



Non-OEM fighter upgrades (F-16)



F-16 global installed base



Broad range of commercial aircraft products

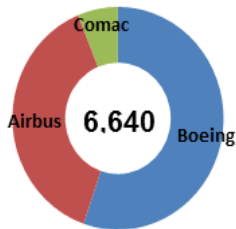
- Active Inceptor Systems
- Actuator Controls
- Back-Up Flight Control
- Data Concentrators
- Fly-By-Wire Primary Flight Control
- Fly-By-Wire Secondary Flight Control
- Remote Electronic Units



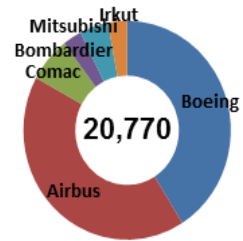
Commercial aircraft market

Forecast Aircraft Deliveries

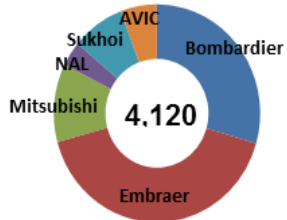
Widebody



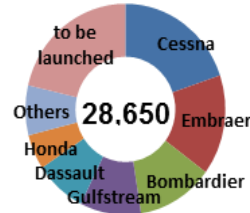
Single Aisle



Regional



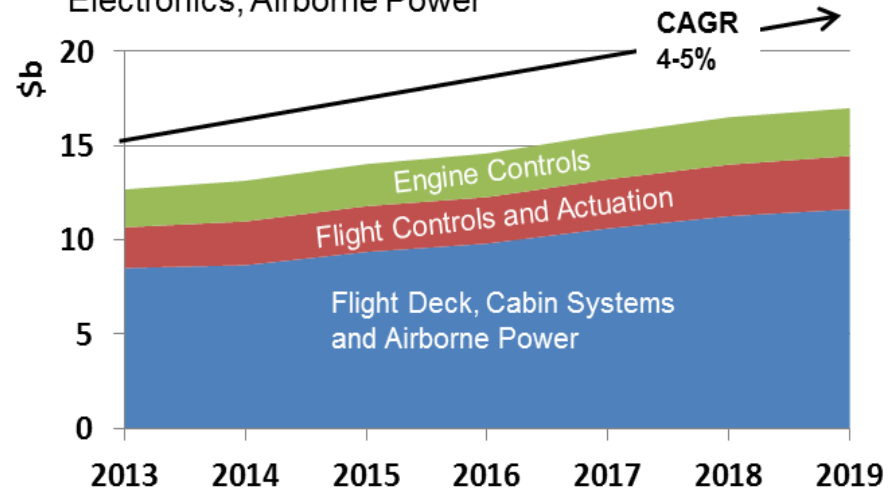
Business Jet



Source: Boeing

Addressable Market



Flight Controls, Engine Controls, Cabin & Cockpit Electronics, Airborne Power



Source: BAE Systems

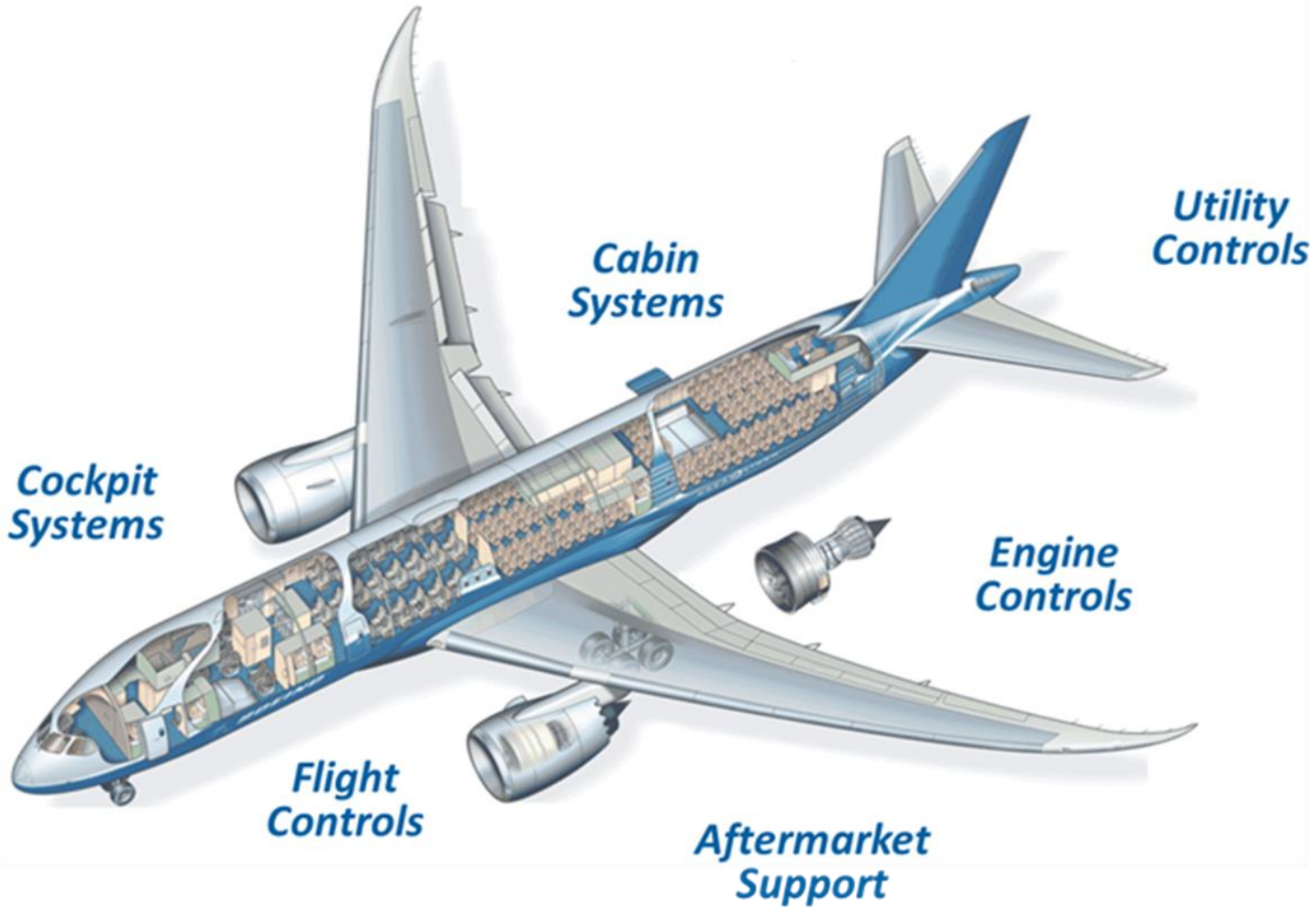
\$12b addressable market expected to grow at ~4-5% with strong deliveries in all segments ...
Underpinned by global traffic growth and emerging economies of the Far East / China

Platform Positions

Platform						
	737	747-8/ 747-400	A320 Family	767	777	787
Engine Controls	✓	✓	✓	✓	✓	✓
Flight Controls	✓				✓	
Cabin & Cockpit Systems	✓	✓		✓	✓	
Platform Status	737 NG in Production 737 MAX in Development	Production	A320 Ceo in Production A320 Neo in Development	Production	777 in Production 777X in Development	Production
# Aircraft in Service**	6,517	661	5,836	923	1,193	156
# Aircraft on Order **	3,870	49 / 0	4,257	49	345	884

** As of May 2014

Broad range of commercial aircraft products

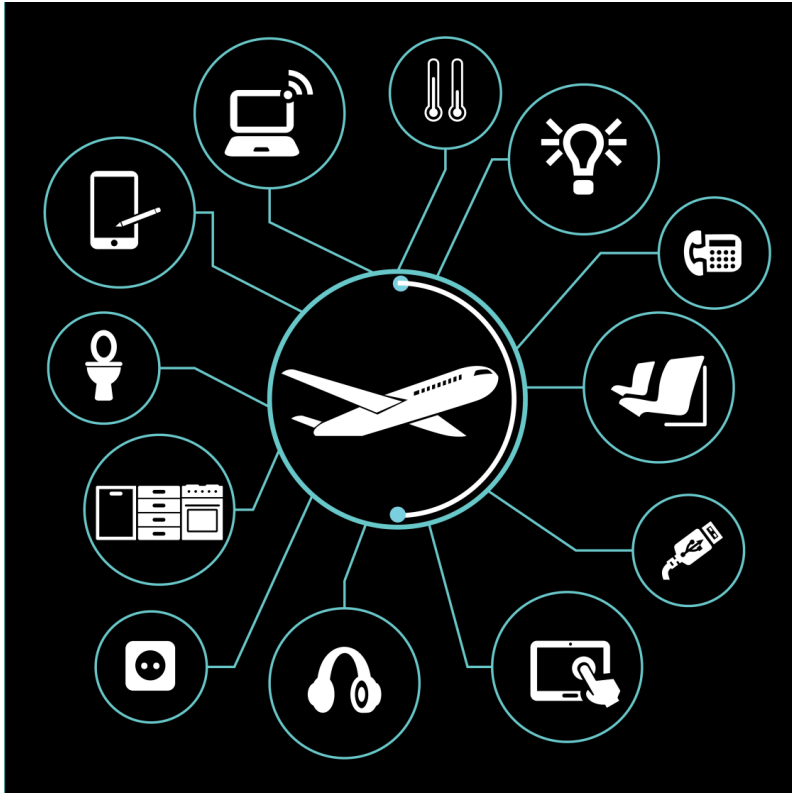




ENGINE & FLIGHT CONTROLS

- Premier FADEC design, development and support
- State-of-the-art fly-by-wire controls on multiple platforms
 - Boeing 777, 747-8, 737MAX, 767
 - Airbus A320
 - Bombardier CRJ, Cseries, Global 7000/8000
 - Embraer Legacy, KC-390

Intelligent cabin systems for the future



IntelliCabin™
STATE OF THE SMART



COMMERCIAL AFTERMARKET SUPPORT SERVICES

Building a worldwide network to support wheels up to wheels down customer service & support

- Engine controls
- Flight controls
- Flight deck systems
- Cabin systems & modifications



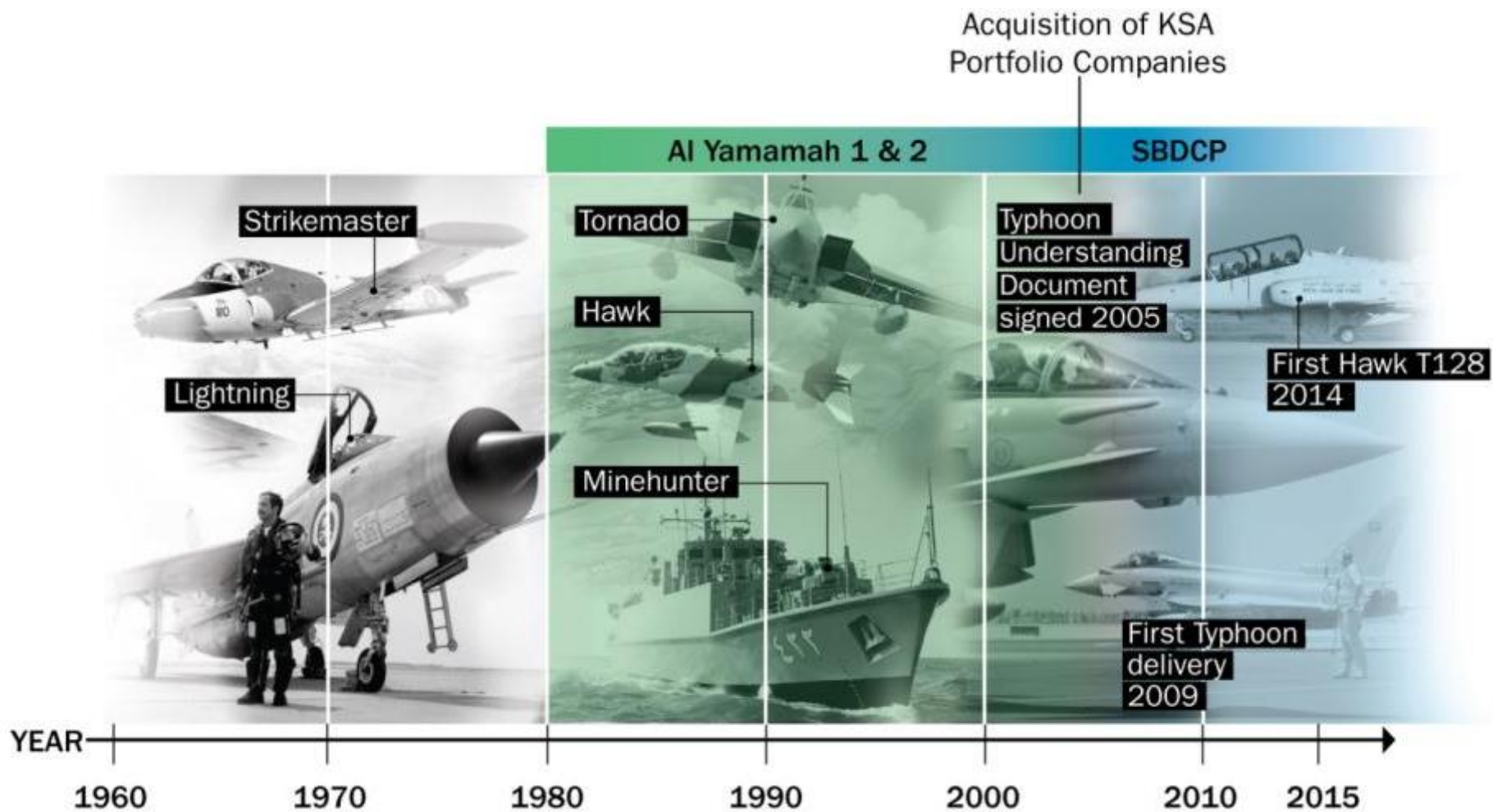
INTERNATIONAL OPERATING GROUP

Guy Griffiths

KSA regional map



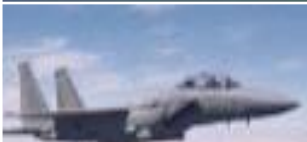




BAE Systems in KSA - timeline





RSAF Force structure

Capability	Type		In service	Service entry	Comments
Combat	F15C/D		81	1991	
	Typhoon		38	2009	72 ordered
	F15S		68	2000	To be upgraded to F15SA
	F15SA		0	Est. 2015	84 ordered in 2011
	Tornado IDS		80	1993	

SCOPE OF ACTIVITIES

SBDCCP	<ul style="list-style-type: none"> •5 year £3.4bn contract agreed in 2012 for RSAF support through to 2016 •£1.6bn aircrew training contract awarded May 2012, including supply of 22 Hawk / 55 Pilatus PC-21 •Number of other spares, maintenance, weapons contracts
Salam Typhoon aircraft	<ul style="list-style-type: none"> •72 aircraft under Batch 1 <ul style="list-style-type: none"> – 24 delivered to end 2011 – 10 in 2013, 12 in 2014, 12 in 2015, 10 in 2016 and 4 in 2017
Salam Typhoon support	<ul style="list-style-type: none"> •5 year £1.84bn programme awarded in 2013



SBDPCP



Technician training



Pilot training



Hawk procurement



PC21 procurement



Tornado upgrades



Weapons



Facilities



Spares, repairs, logistics



SALAM



Aircraft supply



Capability upgrades



Support



Facilities



Weapons



BAE Systems in Oman - Timeline



1974

- 32 Hunters

1977

- 27 Jaguars

1968

- 24 Strikemaster

1959

Sultan of Oman Air Force Formed

- 2 Scottish Aviation Pioneers
- Percival Provost



Percival Provost



Strikemaster



Jaguar

1994

- 12 Hawk Mk 203

1993

- 4 Hawk Mk 103



Hawk Mk 203

2012

- 12 Typhoon
- 8 Hawk Mk 166



Typhoon

1959

55 Years

1960

1970

1980






1990

2000

2010



Oman: Force structure

Capability	Type		In service	Service entry
Combat	Jaguar		5	1977
	Hawk Mk 103 Hawk Mk 203		14	1994
	F16		11	2005
	F16		0	2014
	Typhoon		0	2017



Oman growth prospects

BAE SYSTEMS
INSPIRED WORK



Weapons









Support



Further
aircraft

Australia: Force Mix



Capability	Equipment Type		In service	Service entry	Comments
Combat	F/A – 18A		55	1985	2021 withdrawal
	F/A – 18F		24	2010	
	EA – 18G		0	Est. 2018	12 new build on order
	F – 35A		0	24 Jul 2014 Est. 2018 FOC 2023	<ul style="list-style-type: none"> • 2 under build • Further 70 approved
Training	F/A – 18B		16	1985	2021 withdrawal
	Hawk 127		33	2001	Air 5438 upgrade

MISSILE CAPABILITY TRENDS

Air-launched weapons providing a major contribution to operational advantage of Air Platforms

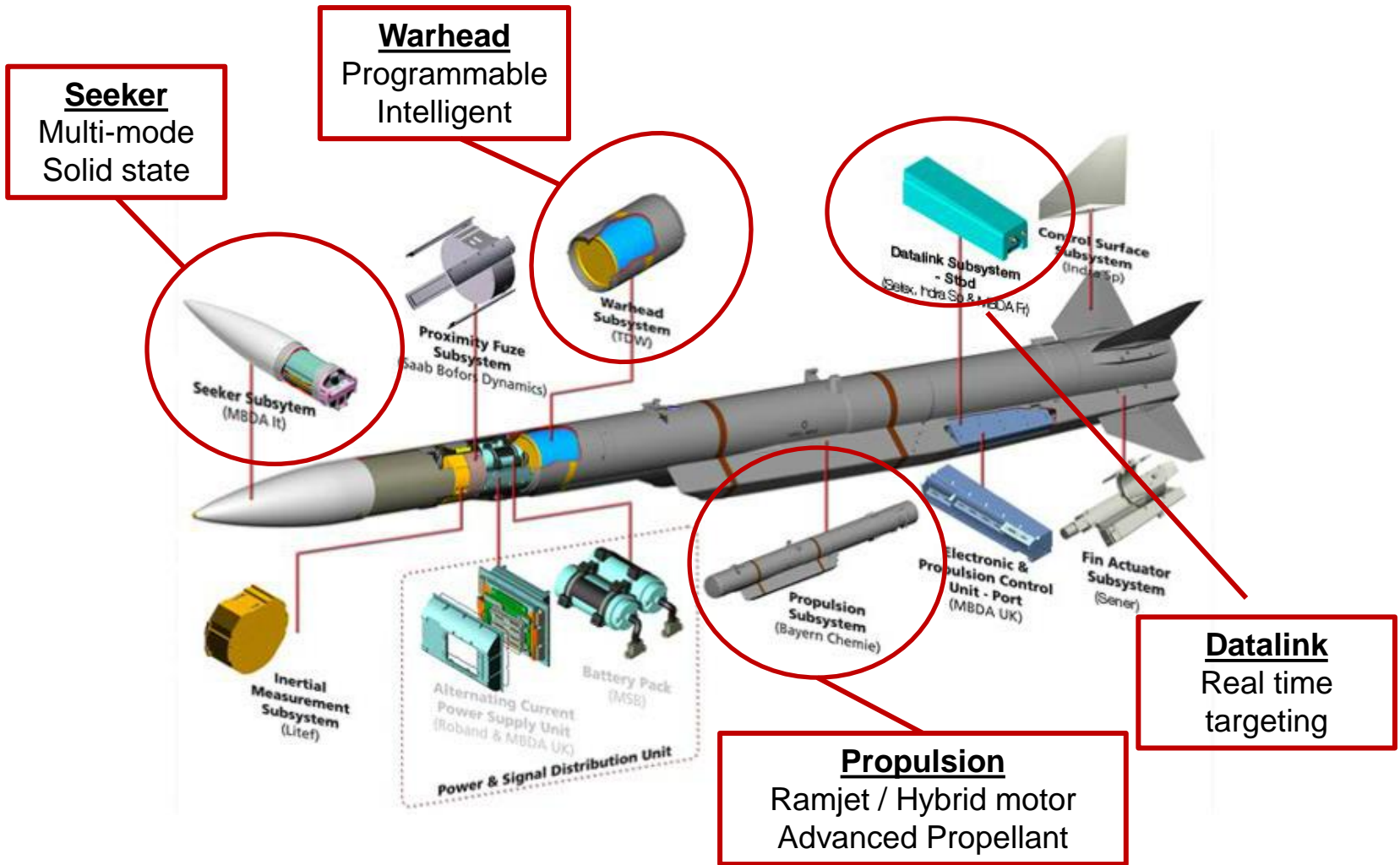
- Total system capability of platform, sensors and weapons

Major political and military drivers for Air-Launched weapons

- Stand-off - for platform survivability
- Selectivity - pick out the chosen target
- Precision - in time and space
- Effect - low collateral and scalable



Technology trends



MAJOR PROGRAMMES

Storm Shadow - long range strike

- Strategic and hardened targets
- Combat proven - Tornado [Typhoon]

Dual-Mode Brimstone - unique precision

- Fast moving targets with low collateral
- Combat proven - Tornado [Typhoon / UAS]

Meteor - step change in air superiority

- Beyond visual range airborne targets
- Production - Typhoon [JSF]

SPEAR3 - step change in surface attack

- Beyond visual range surface targets
- Development - JSF [Typhoon / UAS]



Aircraft platforms - MBDA weapons access

	Tornado	Typhoon	F-35	Rafale	Gripen	F-15/F-18
Air-to-Air Interception		Meteor	Meteor (@ Block 4)	Meteor RF/IR MICA	Meteor RF/IR MICA	
Air-to-Air Combat	ASRAAM	ASRAAM	ASRAAM (@ Block 3)	IR MICA		ASRAAM
Anti-Ship		Marte ER Spear3		Exocet AM39		
Deep Strike	Storm Shadow Taurus	Storm Shadow	Storm Shadow (@ Block 5)	Storm Shadow	Taurus (envisaged)	Taurus
Stand-Off/ Close-Air-Support	Brimstone	Spear3 Brimstone	Spear3 (@ Block 5)			

Nigel Whitehead

UAS / FCAS



UAS DEVELOPMENT

- Sustaining and developing air systems engineering skills and capabilities
- Taranis – most advanced aircraft ever built and flown by British engineers
- Success of Taranis and Mantis programmes positions us as partner of choice for future UAS collaboration

FCAS programme timeline

